Chapter 9

Strategies and Tools to Maintain or Restore Floodplain Resources

Chapter Overview

The two primary goals of floodplain management are (1) reduction of economic losses and threats to public health and safety from flooding, and (2) preservation and restoration of the natural and beneficial functions and resources within floodplains. Means of achieving the first goal were addressed in Chapter 7. Floodplain natural resources and functions were described in Chapter 8. The focus of this chapter will be on the second goal – the maintenance of existing functions and resources and opportunities to restore lost or diminished attributes.

The "preservation" and "restoration" strategies may be applied individually or in combination. Under each "strategy" there are a number of "tools" that can be employed. This chapter will address these strategies and tools.

Introduction

Traditionally, while much attention has been focused on the hazards and inconveniences associated with floods, floodplains, and river corridors, less attention has been directed towards natural resources of floodplains. *Because most non-tidal wetlands are located within floodplains, the strategies and tools discussed in this chapter to maintain or restore floodplain resources implicitly apply to nearly all wetland resources. In most instances whenever the term "floodplains" is used, "wetlands" can be substituted.*

In the past, lack of understanding of the functioning of the single, integrated natural system of the watershed and its component processes contributed to significant alteration of the natural functions of floodplains, and in many cases to the degradation and destruction of these resources. One authority estimates that 70 to 90 percent of all natural floodplain habitats have been extensively altered.

In response to these development pressures, knowledge and information regarding the natural resources, processes and values of floodplains can help to protect the resources and benefits they provide. This improved knowledge and information can be used to differentiate between lands that should remain in their natural condition, lands that can accommodate certain uses but not others, and lands that are most suitable for development.

Floodplains in the natural or relatively undisturbed state provide three broad sets of natural and beneficial resources, and hence resource values: water, biologic and societal resources. Figure 8-1 in the previous chapter provides a listing of specific resources associated with each category.

Vulnerability of Natural Floodplain Resources

Natural systems are not constant. Streams, lakes, and oceans flood adjacent lands and constantly shape landforms. Other natural hazards, such as earthquakes, also alter landforms and drainage. Human intervention in the floodplains can be equated in part to these extremes of nature, in that it can lead to major disruptions, largely accelerations, of natural processes. But whereas recovery ordinarily proceeds following natural interruptions, recovery is not likely after human interventions. The major difference is that the changes brought about by human intrusions and their accompanying works remove conditions under which natural processes can continue.

Three general kinds of adverse outcomes from development and modification of natural floodplains bear on the condition or degree of vulnerability of water resources. First, increased runoff generally accompanies any activity involving widespread clearing, wetlands destruction, dune removal, paving, and roofing. Second, runoff is blocked or groundwater movement is interrupted. Third, pollution loadings on the resources are increased.

Development and modification of the floodplain can also have direct impacts on biologic resources. In addition to problems related to sedimentation, which may bury food sources and spawning areas; pollution, which can poison and deprive living resources of oxygen; human use and development can have the following effects. First, human actions typically remove cover, and hence shelter, for game. Second, barriers to movement of animals are inserted between their preferred habitat and water bodies. Third, food sources are eliminated. Some of these impacts may not be localized, but may extend well beyond the site of development actions. This is so because floodplain wetlands are major sources of food and breeding habitat for both saltwater and freshwater fish and for many types of wildlife.

The adverse impacts of floodplain development and modification on values associated with societal resources have often been overlooked. Accelerated runoff, blocked runoff, interrupted groundwater flow, and increased pollution loadings frequently destroy or degrade educational sites (historical, archeological and scientific) and esthetic qualities (urban open space and sound absorption). Poor agricultural, aquaculture and forestry land use practices can be just as destructive of floodplain resources as the more obvious forms of development.

Strategies for Managing Floodplain Natural Resources

Only in the past few decades have the natural and cultural resources of floodplains been recognized as valuable in their own right. As described above, all of these resources are threatened by various human and natural conditions, particularly by floodplain modification and development. Only a limited type and amount of human uses are compatible with most

floodplain resources, and there is general agreement among floodplain management professionals that the natural and cultural resources of floodplain are not being adequately protected. Of course, the best means to protect these resources is to avoid floodplain development. Where avoidance is not practical, minimization of use and impacts is desirable. There are two basic strategies to address floodplain resources:

- Preservation
- Restoration

The preservation strategy focuses on the immediate impacts of the proposed floodplain actions. This strategy involves prevention of alteration of the natural and beneficial floodplain resources, or maintenance of the floodplain environment as close to its natural state as possible, using all practicable means.

Restoration as a strategy for protection of natural and beneficial floodplain functions focuses on conditions existing as a result of prior actions. This strategy calls for proposed actions to provide re-establishment of a setting or environment in which these functions can again operate. Where floodplain resources have been degraded by past activities, identification and evaluation of the diminished or lost resources should be made so that remedial actions may be taken to restore those functions.

It is not always possible to make a clear distinction between the two strategies. Preservation and restoration of floodplain resources are often accomplished, either directly or indirectly, through a wide variety of development controls or by means of regulatory standards designed to protect valuable natural resources or minimize adverse impacts on those resources.

Types of regulatory and management programs that directly or indirectly contribute to the restoration and preservation of living resources/habitat resources include:

- Single or multi-purpose resource management and protection programs that include objectives for habitat and living resources protection, and that apply to floodplains;
- Incorporation of provisions for protection of habitat and living resources in zoning, subdivision, or other land-use regulations that apply in whole or in part to floodplains; and
- Incorporation of specific provisions related to living resources and habitat protection in floodplain management programs and regulations.

Descriptions of federal regulatory and management programs that are, or may be, applied will be discussed in a subsequent chapter.

Preservation and restoration of floodplain water resources has been accomplished through a variety of water supply, watershed management, agricultural erosion control, and water

quality maintenance and improvement programs. Protection of floodplain cultural resources has often been accomplished through open space and recreation planning and urban renewal programs, especially in older cities where early settlement concentrations occurred in the floodplain. Some of these programs include waterfront redevelopment projects, historic and cultural resources protection programs, and a variety of multi-purpose open space programs, including programs that focus on the development of water-oriented recreation, public access, and green belts.

As shown in Table 9-1, there are a number of "tools" that can be used to preserve and protect floodplain natural and cultural resources. A similar list of flood loss reduction tools was presented in Chapter 7.

Table 9-1. Strategies and tools for natural resource loss reduction.

Strategies:

1. Restoration of Natural Resources
2. Preservation of Natural Resources

Tools:

1. Floodplain, Wetland, Coastal Barrier Resources Regulations
    a. State Regulations
    b. Local Regulations
        1) Zoning
        2) Subdivision Regulations
        3) Building Codes
        4) Housing Codes
        5) Sanitary and Well Codes
        6) Other Regulatory
2. Development and Redevelopment Policies
    a. Design and Location of Services/Utilities
    b. Land Rights, Acquisition and Open Space
    c. Redevelopment
    d. Permanent Evacuation
3. Information and Education
4. Tax Adjustments
5. Administrative Measures
6. Beach Nourishment and Dune Building

Source: Federal Interagency Floodplain Management Task Force. A Unified National Program for Floodplain Management. Washington, DC, Federal Emergency Management Agency, 1986.

Engineering techniques and institutional means of flood loss reduction are much better understood and more clearly embodied in various federal and state programs than are comparable techniques and institutional programs for protection and restoration of natural resources and functions. As a result, these tools and their application may not be as well documented or understood as those for flood loss reduction, but they should be used to support one another and may be integrated with flood loss reduction tools.

Tools for Managing Floodplain Natural Resources

There are a number of ways in which the strategies and tools for natural resource loss reduction may be used to protect floodplain natural and cultural resources. They are listed in Table 9-2.

Table 9-2. Examples of tools for protecting and managing natural floodplain resources.

Flood Storage and Conveyance:

- Minimize floodplain fills and other actions that require fills, such as construction of dwellings, factories, highways, etc.
- Require that structures and facilities on wetlands provide for adequate flow circulation.
- Use minimum grading requirements and save as much of the site from compaction as possible.
- Relocate nonconforming structures and facilities outside of the floodplain.
- Return site to natural contours.
- Preserve free natural drainage when designing and constructing bridges, roads, fills and large built-up centers.
- Prevent intrusion on and destruction of wetland, beach, and estuarine ecosystems, and restore damaged dunes and vegetation.

Water Quality Maintenance:

- Maintain wetland and floodplain vegetation buffers to reduce sedimentation and delivery of chemical pollutants to the water body.
- Support agricultural practices that minimize nutrient flows into water bodies.
- Control urban runoff, other storm water, and point and nonpoint discharges of pollutants.
- Support methods used for grading, filling, soil removal, and replacement, etc. to minimize erosion and sedimentation during construction.
- Restrict the location of potential pathogenic and toxic sources on the floodplain, such as sanitary land fills and septic tanks, heavy metal wastes, etc.

Table 9-2. Examples of tools for protecting and managing natural floodplain resources. (continued)

Groundwater Recharge:

- Require the use of pervious surfaces where practicable.
- Design construction projects for runoff detention.
- Dispose of spoils and waste materials so as not to contaminate ground or surface water or significantly change land contours.

Living Resources and Habitat:

- Identify and protect wildlife habitat and other vital ecologically sensitive areas from disruption.
- Require topsoil protection programs during construction.
- Restrict wetland drainage and channelization.
- Reestablish damaged floodplain ecosystems.
- Minimize tree cutting and other vegetation removal.
- Design floodgates and seawalls to allow natural tidal activity and estuarine flow.

Cultural Resources:

- Provide public access to and along the waterfront for recreation, scientific study, educational instruction, etc.
- Locate and preserve from harm historical and cultural resources; consult with appropriate government agencies or private groups.

Agricultural Resources:

- Minimize soil erosion on cropped areas within floodplains.
- Control use of pesticides, herbicides, and fertilizer.
- Limit the size of fields and promote fence rows, shelter belts, and stripcropping for improved wildlife habitat.
- Strengthen water bank and soil bank type programs in a manner consistent with alternate demands for the use of agricultural land.
- Minimize irrigation return flows and excessive applications of water.
- Eliminate feedlot-type operations.
- Discourage new agricultural production requiring use of drainage.
- Retain agricultural activity on highly productive soils where flood risk is compatible with the value of crops grown.

Aquacultural Resources:

- Construct impoundments in a manner that minimizes alteration in natural drainage and flood flow. Existing natural impoundments such as oxbow lakes and sloughs may be used with proper management.
- Limit the use of exotic species, both plant and animal, to those organisms already common to the area or those known not to compete unfavorably with existing natural populations.

Table 9-2. Examples of tools for protecting and managing natural floodplain resources. (continued)

- Discourage mechanized operations causing adverse impacts. Machinery such as dredges, weeders, and large-scale harvesting equipment may lead to environmental problems such as sediment loading in adjacent watercourses.
- Use extreme caution in the disposal of animal waste.

Forestry:

- Control the practice of clear-cutting, depending upon the species harvested, topography, and location.
- Complement state law governing other aspects of harvest operations; proximity to watercourses, limits on road-building, equipment intrusions, etc.
- Include fire management in any overall management plans. Selective burning may reduce the probability of major destructive fires.
- Require erosion control plans on all timber allotments, roads, and skidways.

Source: Federal Interagency Floodplain Management Task Force. A Unified National Program for Floodplain Management. Washington, DC, Federal Emergency Management Agency, 1986.

The following sections of this chapter describe some of the more prominent ways that the tools under the two strategies have been applied. The same types of tools are also used, as described in Chapter 7, to minimize susceptibility to flood losses and the impacts of those losses.

In many cases, actions to reduce flood losses also serve to protect natural resources. In other instances, flood loss reduction efforts conflict with those to protect and restore floodplain natural and cultural resources. There are, however, many instances where flood loss reduction and natural resource protection efforts have been successfully combined. Conflicts with flood loss reduction goals can often be resolved through integrated management approaches and practices designed by interdisciplinary teams that include ecologists, biologists, and natural resource managers.

Regulations to Protect Floodplain Natural and Cultural Resources

Regulatory measures are among the most widely used and most effective means of protecting the natural and cultural resources of floodplains, and are used by all governmental levels. Regulations, however, are limited in their ability to achieve total resource protection of floodplain resources and functions, largely because the excessive restrictions on use of private property as a means of resource protection may deny the owner all potential for economic return. This could possibly result in an unconstitutional "taking" of private property. (This subject is covered in Chapter 12.) Where complete

protection of a resource is required, use of some other tool, such as acquisition, may be necessary.

Federal Regulations
(These will be discussed more extensively in Chapter 11 but are presented here, in abbreviated form, in the context of the subject matter of this chapter.)

The National Environmental Policy Act
The National Environmental Policy Act (NEPA) (P.L. 91-190) enacted in 1970 requires federal agencies to include detailed evaluations of the potential impacts of floodplain development and use on natural floodplains resources as part of the decision-making process. The NEPA requirements have facilitated the protection of floodplain resources by establishing procedures for environmental assessment. NEPA and other legislation have resulted in broader views and goals for floodplain management.

The Clean Water Act and the Section 404 Wetlands Regulatory Program
The Clean Water Act (P.L. 92-500 and subsequent amendments) enacted in 1972 contains many provisions that protect natural resources and functions. The major regulatory tool at the federal level for managing floodplain natural resources is the Section 404 regulatory program established by the Act. This program regulates the discharge of dredged or fill material into "waters of the United States," including adjacent wetlands. Permit applications are subject to a "public interest review" that includes consideration of floodplain resources. The program guidelines provide extensive environmental criteria for judging permit applications, emphasizing the need to prevent avoidable losses of aquatic resources, as well as the need to minimize adverse environmental impacts.

In addition to the Section 404 program, other regulatory provisions of the Clean Water Act, such as those governing municipal and industrial waste discharges, are critically important for maintaining water quality or restoring it to levels that can support fish and wildlife and associated habitat.

The Endangered Species Act
Plant and animal species may become threatened or endangered as a result of natural events and human activities. A number of these species require or use floodplain habitats at some point in their life cycle.

One of the most significant developments relating to an increased understanding and protection of rare species – including those occupying floodplains – was the establishment of a national program for identifying and protecting rare species of flora and fauna in immediate or foreseeable danger of extinction throughout all or a major part of their geographic range. The Endangered Species Act of 1973 (P.L. 93-205) established a

program to designate and protect such species as "endangered" or "threatened." Under the Act, federal agencies are directed not to authorize, fund, or carry out actions that may jeopardize the existence of or modify the habitats of endangered or threatened species. Many states have developed their own programs for identifying species and have entered into agreements with federal agencies for their protection.

The Coastal Zone Management Act

The Coastal Zone Management Act (P.L. 92-583) provides funding assistance to states (and indirectly to local governments) for a wide range of resource protection activities, including activities that directly or indirectly affect the nation's coastal floodplains. If a coastal management program has been adopted by a state (and by local governments) and approved at the federal level, most activities in the coastal zone are required to be consistent with the adopted program.

The National Historic Preservation Act

The National Historic Preservation Act of 1966 (P.L. 89-665) was passed, in part, because the Congress recognized that federal projects, such as highways, flood control structures, and urban renewal activities, had damaged or destroyed thousands of historic properties during the preceding decades. The Act requires federal agencies to consider the effect of any federal action on historic properties included in a national register of historic sites, buildings, structures, and objects. In general, the federal government provides guidelines, technical assistance, and grants-in-aid for state and local historic preservation efforts, and monitors its own activities so as not to unnecessarily harm historic properties.

State and Local Regulations

Floodplain, wetland, and coastal barrier management and protection at the state and local levels can be accomplished with a variety of regulatory tools, such as those described in Chapter 7, that contain provisions for preserving and restoring floodplain resources. Statewide regulations may be applied directly by a state or, as is more often the case, by local governments according to state-established standards.

All coastal states and many inland states regulate wetlands. Often state programs establish a permitting system for development activities that would alter the characteristics of coastal wetlands. Some states outline minimal criteria (e.g., the proposed projects must be in the public interest or water-dependent) for issuance of permits.

Local regulations, including zoning and subdivision regulations, building and housing codes, sanitary and well codes, and other regulations, may directly or indirectly address management of floodplain natural resources. These provisions include: specified distances that buildings must be set back from the shore; density limitations in shoreland areas; restrictions or prohibitions on certain kinds of development in highly sensitive areas; and specification of uses compatible with natural resources protection. A variety of other

regulatory measures address natural resources, including regulations pertaining to riparian habitat protection and agricultural use. Many communities apply several types of regulations in combination with other floodplain management and resource protection measures, such as beach, dune, and inland wetland protection.

Development and Redevelopment Policies and Programs

Provisions for protecting floodplain natural and cultural resources can be incorporated in a variety of development and redevelopment policies and programs. They may include the design and location of services and utilities, open space acquisition, urban renewal, and other actions.

Design and Location of Services and Utilities

In addition to the use of regulatory methods to control development in floodplains, discussed above, local governments may establish programs, policies, and directives that discourage inappropriate uses of the floodplain. This could be applied to resource sensitive areas. Typically these types of policies require the local governing body to take action rather than impose requirements on private property owners. One such effective action that may be undertaken involves the location of services and utilities, an approach introduced in Chapter 7.

The design of services and utilities can have both direct and indirect impacts on future floodplain use and development and therefore on the protection of floodplain resources. If roads, bridges, sewer and water lines, and other utilities are constructed in floodprone areas, these services and utilities can indirectly lead to more intense use of the floodplain and directly impact its natural resources and functions. For example, placement of a sanitary sewer line in a floodplain may create additional pressure on local authorities to allow development on the floodplain and connection to the sewer line. On the other hand, little development is likely to take place if the locality has an official policy prohibiting the extension of services and utilities into floodprone areas or denying hookups for new development in these areas.

Land and Open Space Acquisition

Federal, state, and local efforts as well as private sector activities contribute to the acquisition and protection of floodplain land. Often these activities are carried out to protect, enhance, or restore a resource (e.g., fish and wildlife) or function (wetlands); or to contribute to a use (parks and recreation). The focus may be on the particular resource, function, or use and not directly on the goal of protecting floodplain resources and functions. But because a large portion of land acquired and managed is located within floodplains, these actions may have important protection consequences.

Where endangered species are involved or the land is otherwise highly sensitive and important for resource protection, acquisition if particularly appropriate. Acquisition can be

carried out by a local public agency, often in partnership with a private group, with state or federal agencies, or through a multiparty arrangement of ownership and management. Programs may include acquisition of scenic easements to protect natural resources.

In recent years, private conservation organizations, in addition to the public sector, have assumed a prominent role in protecting sensitive areas, principally wetlands. Organizations such as The Nature Conservancy, Ducks Unlimited, Trust for Public Land, and the National Audubon Society have acquired a number of areas for permanent protection. Many other land trust organizations exist at the regional, state, and local level.

Lands acquired by private conservation organizations and nonprofit land trusts are sometime held and managed by the trust itself through paid managers or volunteers. In other cases, lands purchased by or donated to these land trusts are reconveyed to public resource agencies. As available dollars for public acquisition have declined in recent decades, the importance of private acquisition and conservation has grown. Private organizations can often move more quickly than public agencies to purchase key lands threatened by development and, when needed, are able to act anonymously. The work of these private conservation organizations is further described in Chapter 15.

Redevelopment

Although federal agencies often contribute significantly to redevelopment programs through funding and technical assistance, redevelopment is primarily a function of state and local governments and the private sector. Much redevelopment of floodprone areas has been associated with a rediscovery of, and reorientation towards, the urban waterfront.

Redevelopment may offer opportunities for restoration of floodplain resources and functions as well as improving blighted and uneconomical development. Rarely is resource restoration the sole motive for redevelopment. Nevertheless, sound floodplain management principles can be applied to practically any redevelopment within the floodplain and opportunities should be sought for resource restoration and improvement. This could include the establishment of greenways, open space, recreation areas, and creation of stream corridors for residents and others to experience and enjoy “nature.”

Permanent Evacuation

Permanent evacuation of a portion of the floodplain, usually as a consequence of a devastating flood event and a goal to eliminate future exposure of flood risk to its present occupants, provides many resource restoration opportunities. Lands can be cleared of buildings and other construction and restored to nearly predevelopment conditions and maintained as open space. Funding has been provided at all governmental levels.

After the 1993 Midwest flood, Congress enacted the Hazard Mitigation and Relocation Assistance Act to increase federal support for relocating floodprone properties. The Act

required the complete removal of the damaged structures and dictated that the purchased land be dedicated "in perpetuity for a use that is compatible with open space, recreational, or wetlands management practices." Some 20,000 Midwest properties were purchased through programs created as a result of the Act. They were also used to purchase several thousand properties in eastern North Carolina resulting from flooding by Hurricane Floyd in 1999. The participating community become tenants of the acquired property and is responsible for maintenance. The property cannot be leased or resold for private use.

Local governments have also initiated projects that involved permanent evacuation of the floodplain, accomplished primarily or entirely with local funds, often as a result of serious flooding problems for decades along a watercourse. They may be part of redevelopment projects.

Clearing of purchased properties of human development, and provisions for their reuse, provides a number of opportunities to restore natural and beneficial resources and functions within floodplain lands. They can be left to return to a "nature" state, meet open space and recreational needs, and/or be the focus of local efforts and projects designed to restore lost or diminished functions.

Information and Education

Technical information and public education related to an improved understanding of floodplain resources are important for public and political support regarding policies and programs for management of these resources. Public education, although less direct than regulation and acquisition, is vital to the establishment of a resource protection program in the long run.

A vast amount of information is available regarding the resources and natural functions associated with floodplains. Many federal agencies provide information on natural resources. Activities include distribution of information on inventories (e.g., the National Wetlands Inventory) and mapping of important natural resources, habitat requirements for species, and measures to preserve and restore natural resources. Federal agencies use a wide variety of media to inform and educate professionals, government officials and employees, and the general public, with the goal of creating a more informed population.

State activities parallel those of the federal government with regard to the types of information provided on floodplain natural and cultural resources. Most states have active programs to prepare and distribute literature and other materials. They also offer instruction to local government staff and officials.

Natural resource inventory and mapping is a major component of many state and local programs. Mapping of wetlands at a larger scale than provided by the National Wetlands Inventory (refer to discussion of the inventory in Chapter 8) can provide valuable

information regarding the most productive and fragile portions of floodplain lands pertaining to natural resources.

The private sector has an active and major role in providing natural resource-related information and education. Literally thousands of organizations exist across the nation with the objectives to provide information and support for natural resources, including floodplain resources. These organizations also use a wide variety of media to reach their membership and the general public. Smaller local organizations offer the major advantage of regular meetings, field trips, and other means of providing first-hand experiences and information to interested individuals.

Along these lines, one excellent educational approach is to allow the general public to "get in touch" with the resource. Examples may include annual stream cleanup programs, a "Day on the River" event, and a river or bay appreciation day in which state or local agencies participate, and adopt a water body program.

Special efforts should be made to target educational materials to the media. Informed and interested newspaper, magazine, radio, and television reporters can play a major role in promoting natural resource protection. The broadcast media, including public television and radio stations, can be used to air public service announcements explaining the importance of wetlands and other critical areas and the adverse consequences resulting from their destruction and degradation.

Educating school children should definitely not be overlooked. Children, who understand the importance of wetlands and other floodplain resources, and the need to protect them, may grow up to become adults who care about the environment. A number of agencies in the public sector, along with several private sector organizations, have developed wetland, wildlife, conservation education, and environmental education materials aimed at school children. Resources include curriculum materials consisting of booklets and other learning activities for children and corresponding teacher guides.

Despite the efforts, described above, at improved information and education regarding floodplain natural and beneficial resources, there remains a lack of information and understanding regarding their value to society. While floodplain resources are adequately recognized and most natural processes in the floodplain are reasonably well understood, only limited information is available quantifying the value of these natural and cultural resources. Improved documentation and quantification (including dollar values) of floodplain natural resources is required to improve public understanding and acceptance of the need for protection.

Much of the private sector, particularly developers, appear not to be aware of the natural and cultural resources of floodplains. The emphasis continues to be on deriving the greatest economic return from each site, within the limits permitted by local planning or zoning

restrictions. Relatively few developers seem to recognize that preservation of floodplains and wetlands not only protects important natural resources and functions, but also esthetic values that can enhance property values. There appears to be widespread agreement that additional information and education is needed regarding the need to protect floodplain natural resources and the tools available for maintaining these resources. If greater understanding of their importance can be achieved, increased demand for preserving natural features may follow, and this may have an effect on development action.

Tax Adjustments

Tax adjustments at the federal, state, or local level can play an important role in protecting natural and cultural floodplain resources. They can influence decisions about floodplain occupancy, can be used to encourage appropriate floodplain use and to discourage inappropriate use, and can also facilitate the acquisition of floodplain land.

The Internal Revenue Code provides that organizations meeting certain criteria may achieve tax-exempt status. Most conservation-oriented organizations are tax exempt and some of them are actively involved in acquiring wetlands and floodplains. Many other professional and conservation organizations would not be able to carry out their programs of environmental education, technical assistance, and other activities without the advantage of tax exempt status. The Code also provides that individuals and business may receive a deduction for the value of land donated to a government agency or qualified nonprofit organization. Generally the property must be donated in perpetuity and used for some historical or conservation-related purpose. Conservation easements as well as outright donations of property may qualify under provisions of the tax code.

At the state and local levels, positive incentives for the preservation and restoration of floodplain resources may be provided through several kinds of tax adjustments. Nearly all states offer broad real estate tax incentive programs for land in agriculture, forestry, and certain other open space uses. Undeveloped floodplains may qualify for reduced taxation pursuant to many of these state statutes. Many localities base their property tax assessments on the present land use and not on the potential value or use of the land, such as for commercial and residential development. This encourages land on the fringes of urban areas to remain in agricultural, open space and like undeveloped uses and reduces the burden of regulation.

Administrative Measures

Many different types of administrative measures can be used to contribute to the preservation and restoration of natural floodplain resources and their associated functions. These measures include,

At all governmental levels:

- Coordination among the various disciplines (wetland management, floodplain management, fish and wildlife management, environmental and resource protection, and others) that can contribute to an improved understanding and protection of floodplain resources;
- Coordination within and among agencies having missions and authorities to plan and implement floodplain management programs;
- Systematic review of existing agency programs to identify opportunities for floodplain resource preservation and restoration.

At the local level:

- Delegation of responsibility for floodplain activities to a specific office with sufficient authority to plan and carry out an active leadership role both within and outside the agency;
- Restrictions or conditions in contracts, grants, loans, permits, and licenses;
- Applications of appropriate encumbrances during land conveyance.

Beach Nourishment and Dune Building

Chapter 8 provided an introduction to coastal ecosystems in discussions of coastal dunes and barrier islands. A program of periodic replenishment of sand along a specified segment of shoreline can help remedy the interruption of natural sand transport caused by development activities or even by the incautious placement of structural protection measures. There is, however, controversy among scientists and engineers regarding the replenishment of beaches eroded by coastal storms as interfering with natural processes. A future storm can erode the artificially placed sand to start the process all over again.

Likewise, building dunes by artificial means or increasing the height of damaged dunes can help preserve and restore the normal physical-biological interplay of the nearshore system, resulting in vastly enhanced aesthetic benefits, improved storm protection, and reduced costs for additional damage mitigation measures. (Beach nourishment programs are described in more detail in Chapter 16.)

Conclusion

Because many of the same strategies and tools that are applied for flood loss reduction also may be used for natural and cultural floodplain resource protection, limited preservation and restoration measures can be accomplished indirectly through flood loss reduction actions. For the most part, efforts to manage floodplain natural resources are carried out separately from loss reduction efforts. Most of the natural and cultural resources of floodplains are not associated exclusively with floodplains but represent an important component of a larger set of resources. As a result, most programs that serve to protect floodplain resources have not been developed specifically for floodplain application but apply to resources found outside the floodplain as well.

The approaches to natural resource protection described in this chapter have, and will hopefully continue to increase awareness and protection of these important and undervalued resources. Additional efforts are needed, however, and increased public awareness and education concerning their importance and the measures that can be used for their protection are also needed. Improved coordination is needed among governmental agencies at all levels to help ensure that diverse programs impacting the floodplain are carried out in concert.

Within the floodplain management community, creative thinking and action continues to be required in order to preserve and restore the natural and beneficial functions and resources within floodplains and inclusive wetlands.

Chapter Homework Assignment

List as many floodplain resource management methods as you can find in this chapter and write a two or three sentence explanation of how each can be effective.